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To: Supervisor Nancy Fahden,  
Supervisor Sunne McPeak,  
Internal Operations Committee

Date: December 4, 1986

From: Mark Finucane, Health Services Director  
by Wendel Brunner, M.D. *Wendel Brunner*  
Assistant Health Services Director  
Public Health Division

Subject: LUNG CANCER INCIDENCE IN  
INDUSTRIAL & NON-INDUSTRIAL  
AREAS IN THE COUNTY

Enclosed is a report from the Health Services Department on the subject of lung cancer incidence in Contra Costa County. With the cooperation of the Tumor Registry of the State Health Services Department, we have determined the incidences of lung cancer in the industrial and non-industrial areas of Contra Costa County for the years 1979 through 1984. That data extends the information previously reported by Dr. Austin, and its evaluation was the major recommendation of Dr. Alan Smith in his consultation on the Austin report for the County Health Services Department. This new data shows that the excess lung cancer incidence previously observed in the industrial areas of the county continues to exist and remains a public health concern. Examination of preliminary lung cancer incidence data for the five Bay Area counties, however, shows that Alameda, San Francisco and Marin generally have higher overall rates than Contra Costa County.

The vast majority of lung cancer in both the industrial and non-industrial areas of the county is directly attributable to cigarette smoking. The most effective public health intervention for reducing the incidence of lung cancer in this county is reducing the rate of smoking, and to this end the efforts of the Smoking Education Coalition, the Richmond Quits Smoking Together project and the countywide Smoking Ordinance are particularly important.

The case control study previously reported by Dr. Austin demonstrates that at least some of the excess lung cancer in the industrial areas is attributable to a greater smoking prevalence in those regions. There may be a contribution to lung cancer in this county, however, from occupational or environmental exposures to toxic substances or other causes. Those contributions, if they exist, will be relatively small compared to the effect of smoking and are, therefore, difficult to conclusively demonstrate by this kind of epidemiologic analysis. It is appropriate, nonetheless, to vigorously identify and control sources of toxic air pollution and occupational exposure to hazardous substances.

WB:jb  
Enclosure

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LUNG CANCER INCIDENCE IN INDUSTRIAL & NON-INDUSTRIAL  
AREAS OF CONTRA COSTA COUNTY FROM 1970-1984

The Contra Costa County Health Services Department, with the cooperation and support of the Tumor Registry maintained by the State Health Services Department, has analyzed the lung cancer incidence rates for white males and white females in the industrial and non-industrial areas of Contra Costa County. The purpose of this investigation is to determine whether the elevated incidence of lung cancer in the industrial areas of the county previously observed for the years 1970 through 1978 still persists. Populations or geographical areas exhibiting elevated incidence of lung cancer or other diseases are of public health concern, and are indications for further analysis and appropriate intervention.

This current analysis was instigated as a follow up to a study of lung cancer in Contra Costa County released in 1982 by Dr. Donald Austin from the Resource for Cancer Epidemiology of the California State Health Services Department. For that study, Dr. Austin divided the county into two areas, an industrial region and a non-industrial region. The industrial region consists of all census tracts that are both zoned and used for heavy industry; the non-industrial region comprises the remainder of the county (See figure 1). Dr. Austin developed lung cancer incidence data for the years 1970 through 1978 from a comprehensive regional based tumor registry covering the five Bay Area counties, including Contra Costa. That data showed a particularly dramatic increased incidence of lung cancer in the industrial area for white males (See figure 2), which approximated a 40% increase incidence in the industrial area for the years 1970 through 1977. There was also an increased incidence of lung cancer for white females in the industrial area, although the difference was not as dramatic. Specific data on lung cancer incidence among Blacks was not included by Dr. Austin. The increased incidence of lung cancer in the region of the county with a major concentration of petro-chemical industry suggested that industrial air pollution may contribute to lung cancer incidence in that area.

Dr. Austin then undertook an extensive case control study of lung cancer in Contra Costa during the years 1980 and 1981 in order to determine the possible causes of the geographical distribution of cancer cases in this county. Dr. Austin concluded, on the basis of that case control study, that the geographical distribution of lung cancer in the county followed the geographical distribution of smoking, and that the excessive lung cancer rates in the industrial region were explained by an increase incidence of cigarette smoking by the population in that area.

In 1985 the Contra Costa County Health Department contracted with Dr. Alan Smith and Kim Waller at the U.C. Berkeley School of Public Health to analyze both the Austin study and a second study undertaken in Contra Costa County by Kaldor, et al, also investigating the connection between industrial air pollution and cancer incidence, and to prepare recommendations for our Health Department. Smith and Waller disagreed with the conclusions of Austin and suggested that smoking most likely explains only a part of the excess lung cancer in the industrial area. Those authors further noted that the difference in lung cancer rates in the industrial and non-industrial areas appeared to be declining substantially from 1976 to 1978, and recommended that priority should be given to





determining whether or not those differences persisted into later years. If the lung cancer rates in the industrial and non-industrial areas approached one another, then we would be dealing with what had become a historical phenomenon. If, on the other hand, the difference in incidences persisted, we would be confronting an on-going public health problem.

For this current analysis populations by age distribution, race, sex and census tract for the years 1979 through 1984 were developed by the Contra Costa County Community Services Department from 1975 and 1980 census data. The California State Health Services Department Tumor Registry then calculated cancer incidence rates for the industrial and non-industrial areas, age adjusted to the 1970 census and expressed as cases per 100,000 population. The results obtained for white males and females are presented in figure 3.

Figure 3 shows that the difference in lung cancer incidence for white males in the industrial and non-industrial areas, while not as dramatic as in 1976, persists through 1984. The industrial areas have an approximately 35% increase incidence of lung cancer for white males as compared to the non-industrial areas for the years 1979 through 1984. The excess incidence of lung cancer for white females in those years averages 20%. The incidence of lung cancer throughout Contra Costa County, but particularly in the industrial area, remains a public health concern. The overall lung cancer rate in Contra Costa County, however, is not unusually high. Preliminary lung cancer rates for the five Bay Area counties for the years 1975 through 1984 show that Contra Costa County had the highest rate only for the year 1977. For the other years that distinction was shared by Alameda County, San Francisco County and Marin County.

There is no doubt that smoking is the major cause of lung cancer in Contra Costa County, both in the industrial and non-industrial regions. More than 80% of all lung cancer in the county is directly attributable to smoking. Figure 4 shows the gradual increase in the incidence of lung cancer in women in Contra Costa County, which reflects the unfortunate general trend of increased lung cancer among women throughout the nation. That trend is due to the increase rate of smoking among women which began about 30 years ago, the "Virginia Slims effect." For lung cancer, at least, women "have come a long way"; last year lung cancer surpassed breast cancer as the leading cancer killer of women in California.

At least part of the excess lung cancer incidence in the industrial areas can also be attributed to excess smoking in those regions, although other causes may be involved as well. The Austin study performed on all the lung cancer cases in 1980 and 1981 showed that for white males, when smoking was controlled for, the difference in lung cancer incidence in the industrial and non-industrial areas remained, but was no longer statistically significant. When the rates for women were controlled for smoking, the incidence of lung cancer in the industrial region was actually less than the non-industrial region, although again the difference did not achieve statistical significance. Smith and Waller in further analyzing Austin's data suggested that industrial air pollution, differences in consumption of the dietary protective factors or some other known factors may explain part of the difference between the industrial and non-industrial rates. The fact that the difference, when controlled for smoking, appears to exist only for men and not for women, indicates that occupational exposures may be a contributing factor in some lung cancer cases.





Certainly the most important public health intervention for the prevention of lung cancer is the reduction of cigarette smoking. The work of the Contra Costa County Smoking Education Coalition, and particularly the efforts of the Richmond Quits Smoking Together project, are especially important. Contra Costa County has lead the way with a countywide Smoking Ordinance, something which neighboring counties with higher rates of lung cancer might wish to consider. There remains the possibility that a portion of the lung cancer burden in the population is due to industrial emissions, occupational exposure or other causes. Such a contribution will be small compared to the affect of smoking and is, therefore, difficult to conclusively demonstrate by this kind of environmental epidemiologic study. The data presented supports the appropriateness, however, of continuing to identify and control sources of toxic air pollution, as well as other aspects of environmental contamination by hazardous materials, and to identify and reduce exposures to hazardous materials in the workplace.









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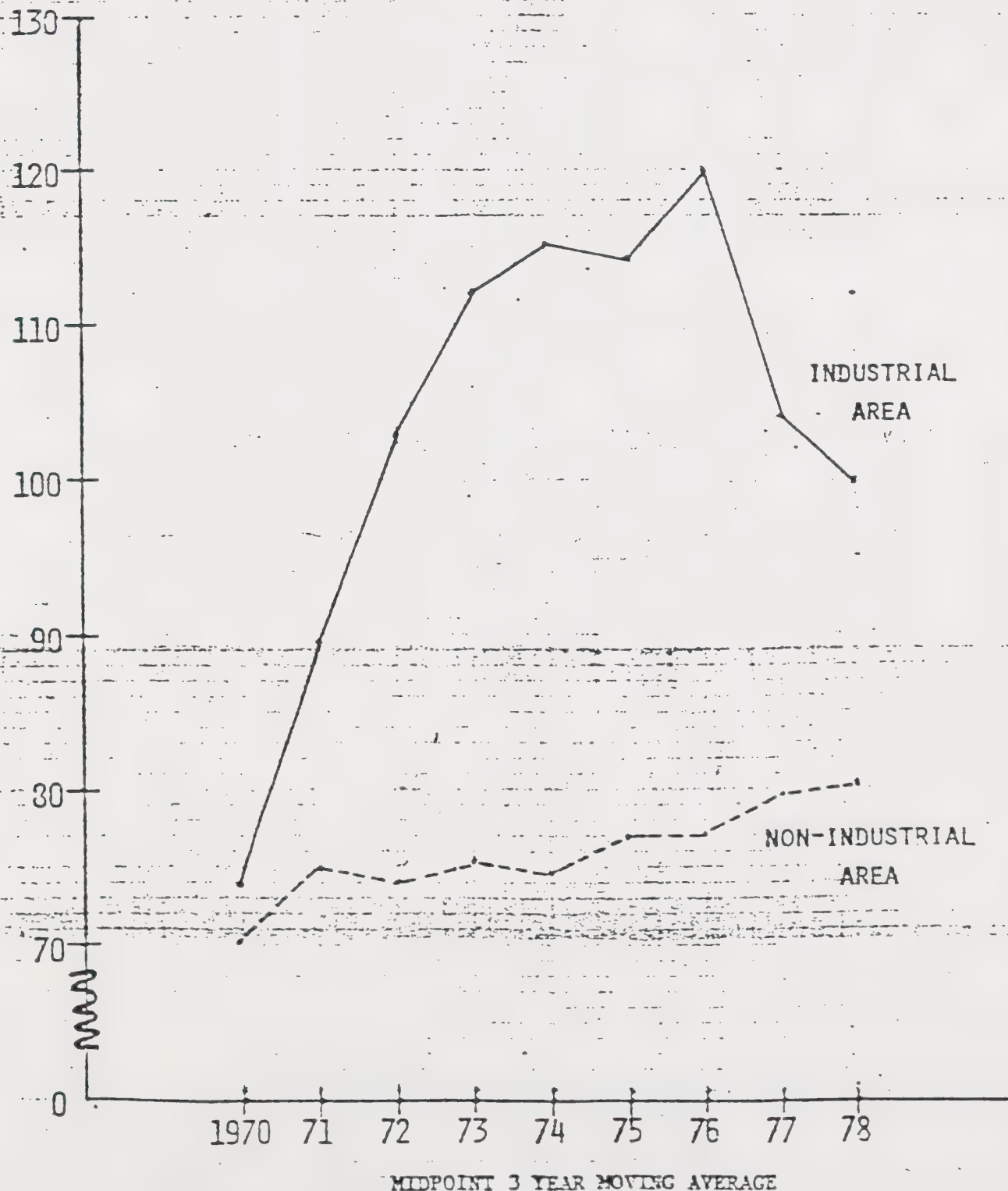
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FIGURE 2

THREE YEAR ANNUAL  
AGE ADJUSTED LUNG CANCER INCIDENCE RATES  
INDUSTRIAL AND NON-INDUSTRIAL AREAS  
CONTRA COSTA COUNTY  
WHITE MALES, 1970-1978

RATE PER  
100,000







# AGE-ADJUSTED LUNG CANCER INCIDENCE RATES INDUSTRIAL AND NON-INDUSTRIAL AREAS CONTRA COSTA COUNTY, 1970-1984

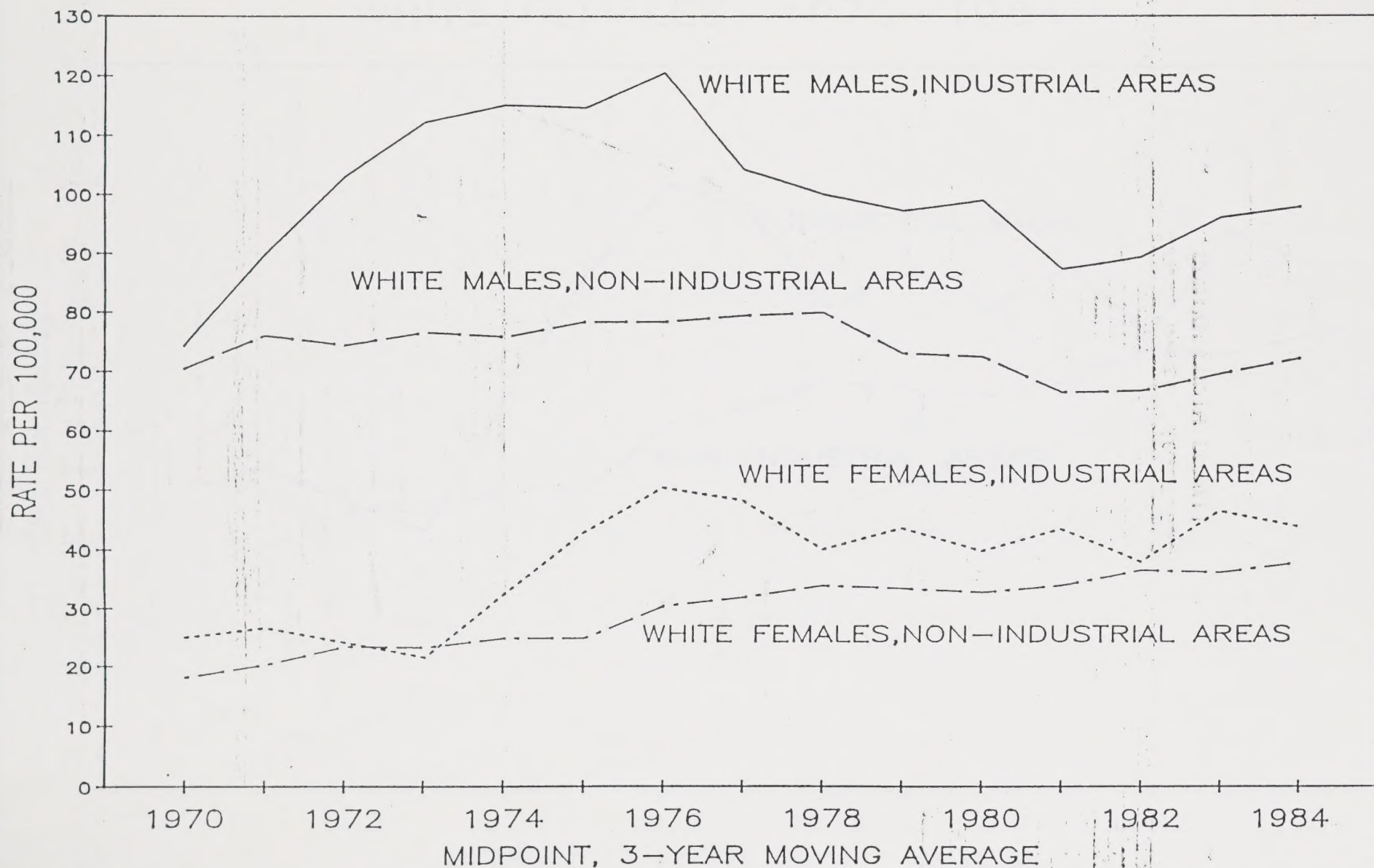


FIGURE 3





AGE-ADJUSTED LUNG CANCER INCIDENCE RATES  
INDUSTRIAL AND NON-INDUSTRIAL AREAS  
CONTRA COSTA COUNTY  
WHITE FEMALES, 1970-1984

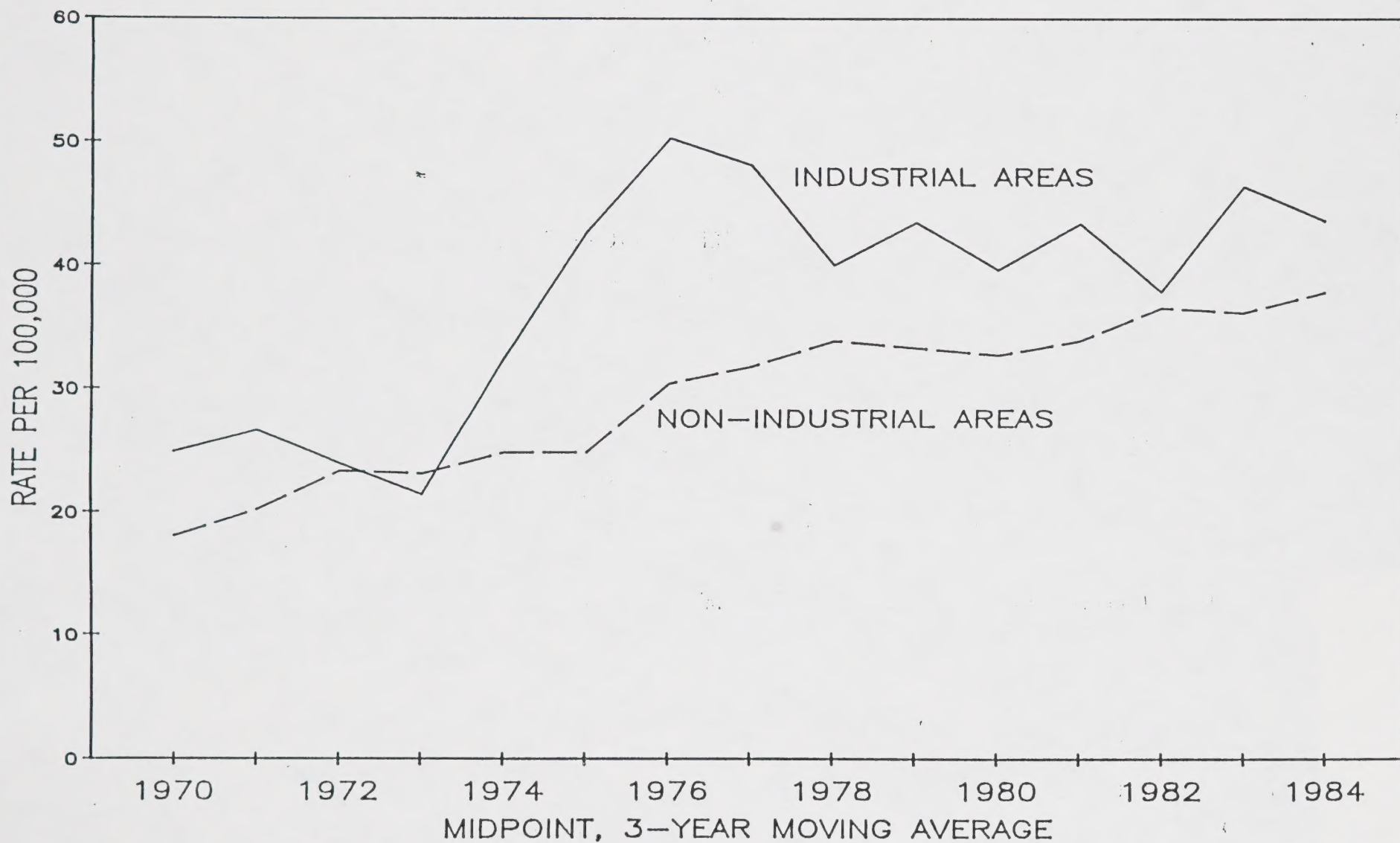


Figure 4

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